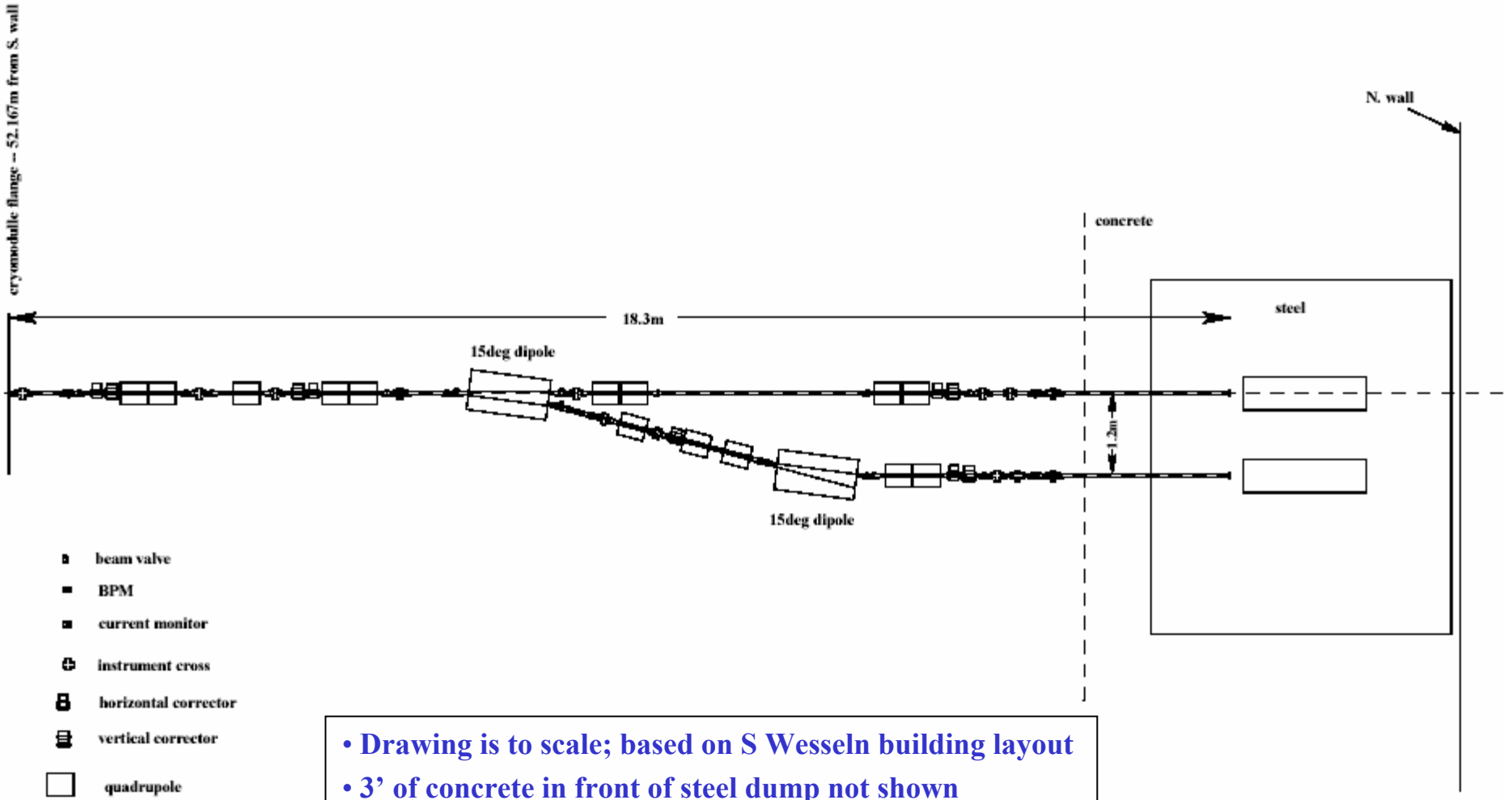
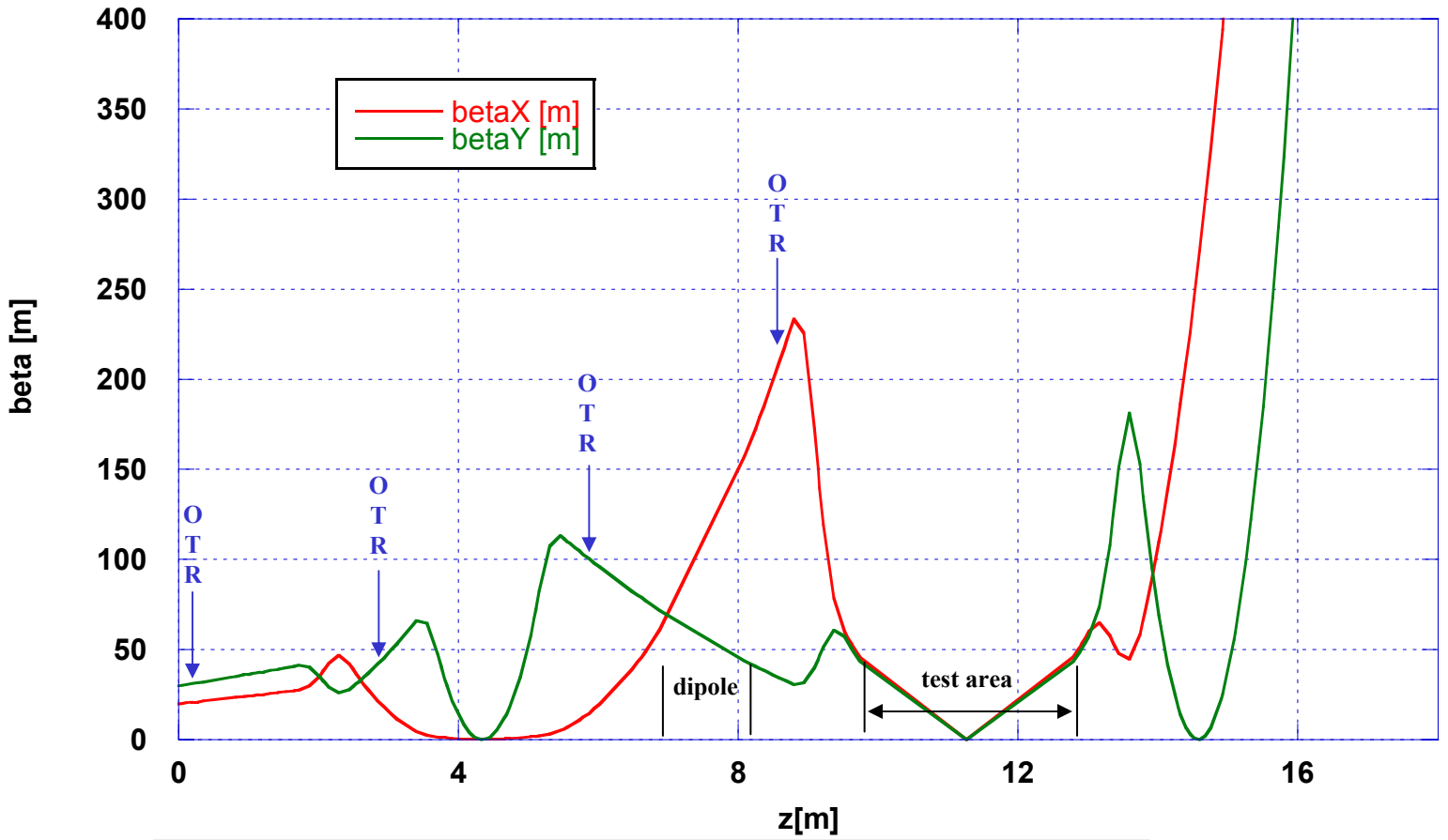
NML Downstream Beamline Layout



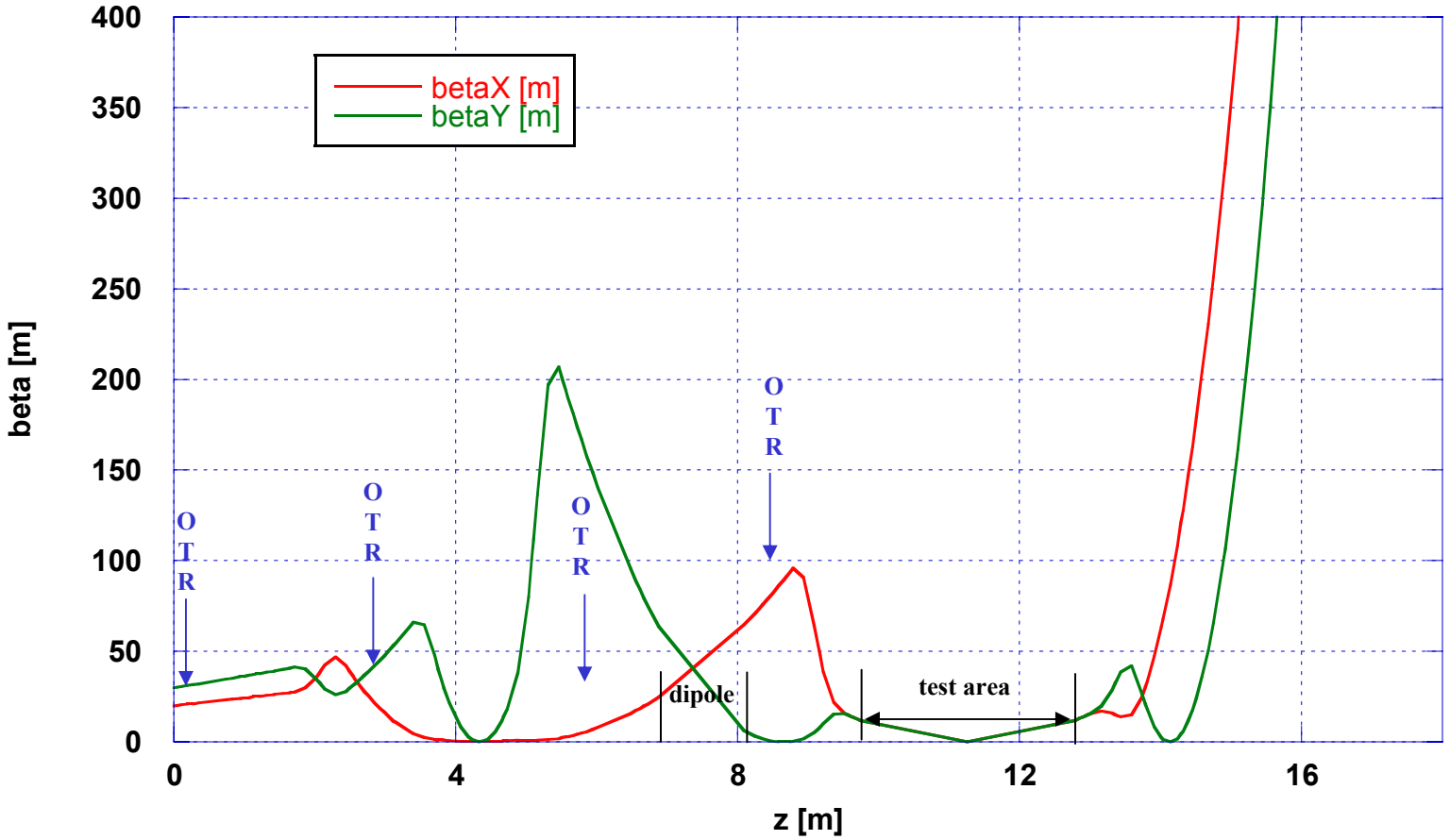
- Drawing is to scale; based on S Wesseln building layout
- 3' of concrete in front of steel dump not shown
- Dump validated for 50KW

Lattice Functions
(straight-through line from d.s. end of 2nd CM to dump)



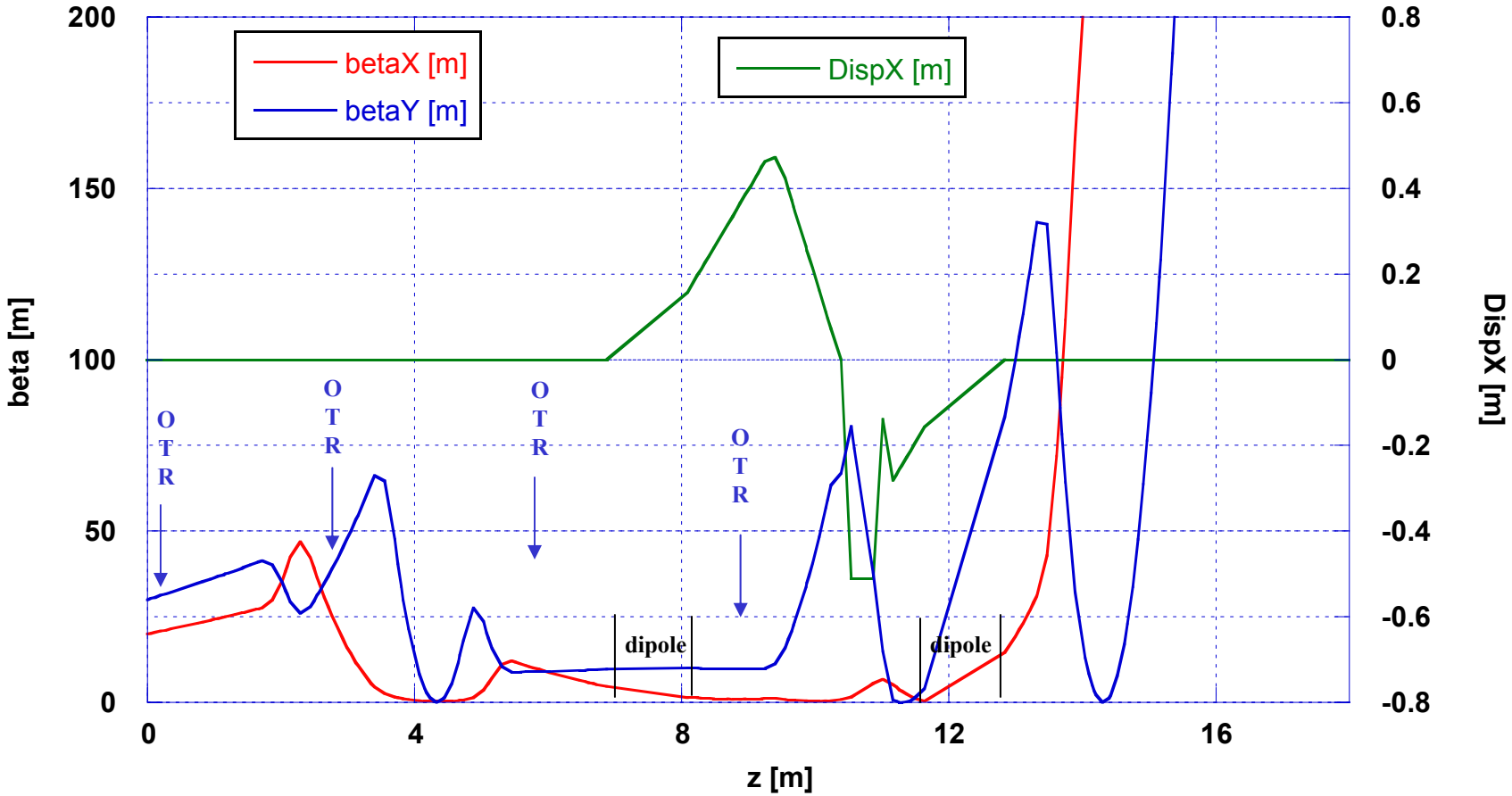
- Initial lattice functions: β_{0x}=20m, α_{0x}=-2.0, β_{0y}=30m, α_{0y}=-3.0
- Beam energy = 570 MeV (2 cryomodules @ 31MV/m)
- Beta @ test area "IP" = 0.05m
- Beta @ Be dump window = 3000m

Lattice Functions
(straight-through line from d.s. end of 2nd CM to dump)



- Initial lattice functions: β_{0x}=20m, α_{0x}=-2.0, β_{0y}=30m, α_{0y}=-3.0
- Beam energy = 570 MeV (2 cryomodules @ 31MV/m)
- Beta at test area "IP" =0.20m
- Beta @ Be dump window = 3000m

Lattice Functions
(spectrometer line from d.s end of 2nd CM to dump)

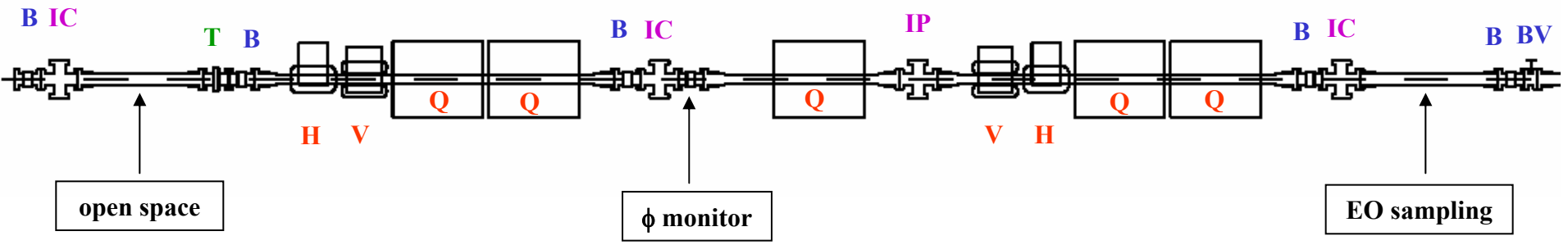


- Initial lattice functions: β_{0x}=20, α_{0x}=-2.0, β_{0y}=30 , α_{0y}=-3.0
- Beam energy = 570 MeV (2 cryomodules @ 31MV/m)
- Max beta = 140m (except near dump)
- Beta @ Be dump window = 3000m

Assumed Components

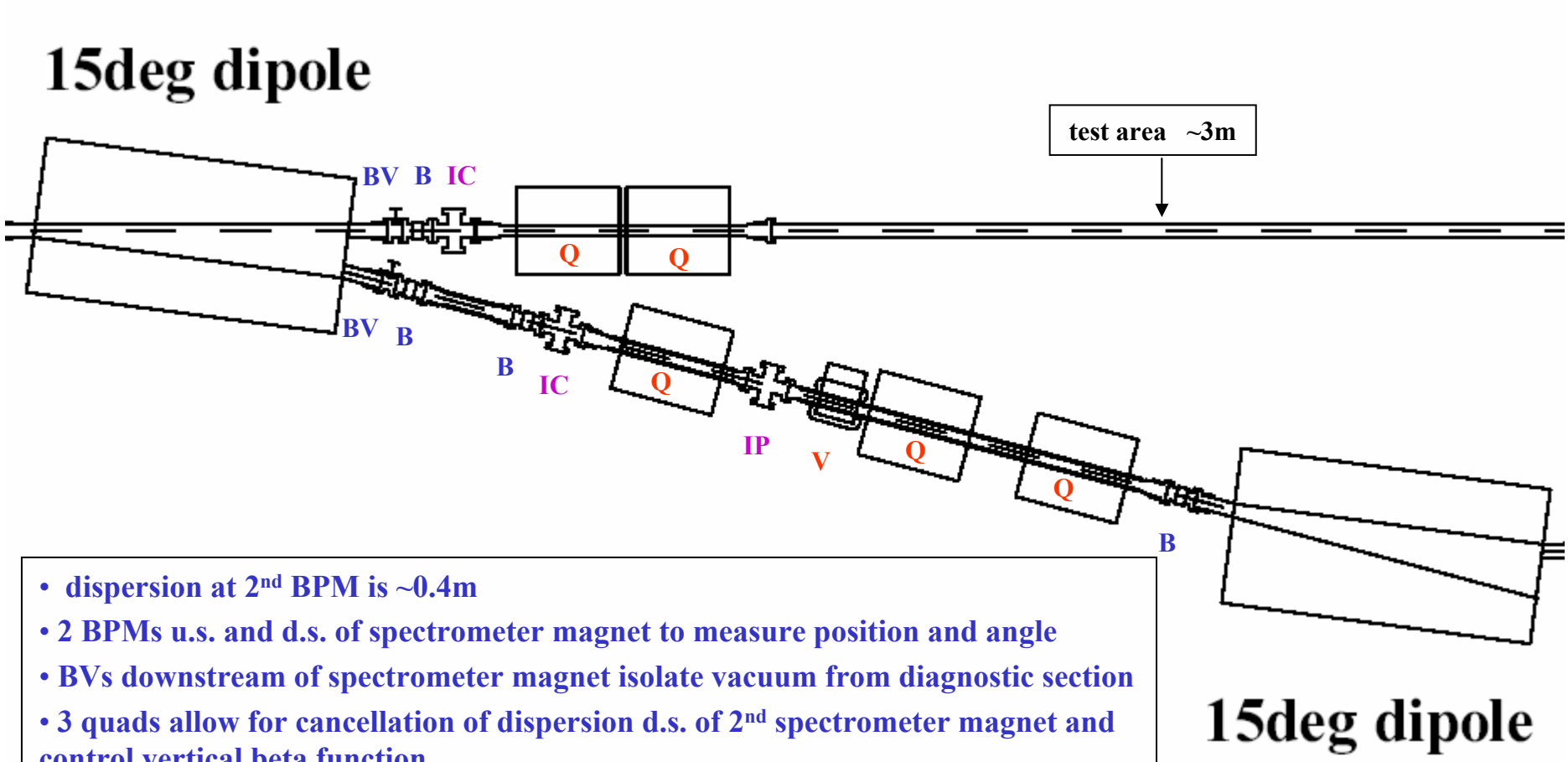
- **Quadrupole:** Efremov-designed TQB for TTF
- **H/V Corrector:** Efremov-designed for TTF
- **Spectrometer Dipole:** new design; 1.2m long; 15° bend; 0.4T @ 570 MeV; good field aperture = 12cm; open aperture = 26cm
- **BPM:** Wendt-designed button type with CF flanges
- **Toroid:** same slot length as BPM
- **Instrument cross:** standard 4, 5, or 6-way cross with CF flanges
- **Vacuum pumping ports:** separate from instrument crosses
- **Bellows:** edge-welded bellows with ~±3mm transverse motion
- **Beampipe:** 2" OD; 1.75" OD in quads
- **Modular design**

Diagnostic Section



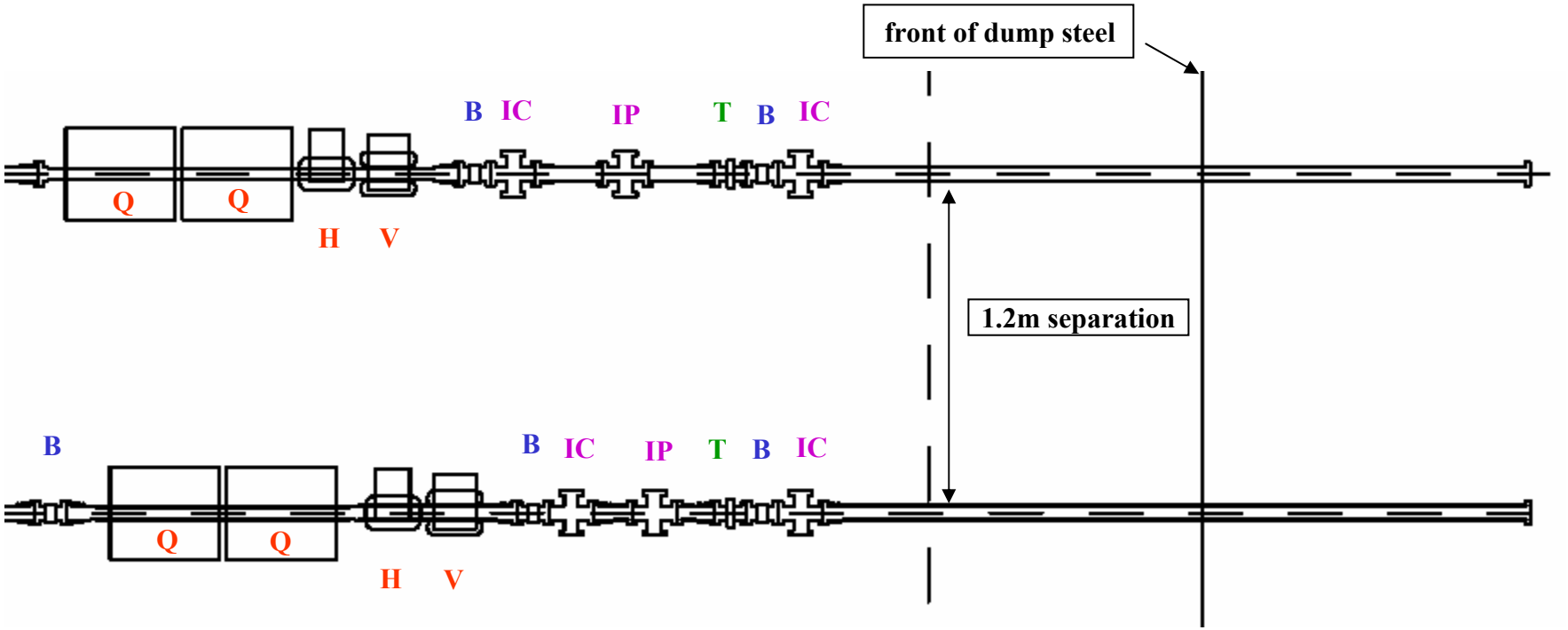
- 5 quads allows matching between d.s. cryomodule and d.s. of spectrometer
- 2 BPMs measure position and angle d.s. of cryomodule; 2 BPMs measure position and angle going into spectrometer; 1 additional BPM for redundancy
- 3 instrument crosses for OTR; 1 cross for vacuum pumps
- 2 correctors in each plane to correct position and angle error at d.s. end of cryomodule
- space reserved for Electo-Optical sampling
- 1 toroid for beam current measurement
- u.s. beam valve is part of the cryomodule

Dispersive Section



- dispersion at 2nd BPM is ~0.4m
- 2 BPMs u.s. and d.s. of spectrometer magnet to measure position and angle
- BVs downstream of spectrometer magnet isolate vacuum from diagnostic section
- 3 quads allow for cancellation of dispersion d.s. of 2nd spectrometer magnet and control vertical beta function
- Single vertical corrector in this section
- Space reserved for more accurate BPM R&D
- Spectrometer bend is 15°

Dump Sections



- 2 quads in each line to blow up spot size on Be window at dump
- 2 correctors in each line to center beam on Be window at dump
- Be window can probably be used for OTR (V. Scarpine)
- 3 ft of concrete in front of dump not shown
- 1.2m separation between beamlines

Installed Component Count

- Quadrupole: 14 (independently powered)
- Corrector: 4 H, 5V
- 15° Dipole: 2
- BPM: 14
- Toroid: 3
- Instrument Cross: 9
- ϕ monitor: 1
- EO sampling device: 1
- Beam valves: 3 (not counting 1 in cryomodule)